

WHAT IS CLAIMED IS:

1. A method for estimating network traffic comprising:
 - receiving and analyzing connectivity information associated with a network to identify a set of parameters, wherein the connectivity information includes a plurality of samples of user activities stored by a node on the network and the set of parameters includes a distribution of network resources across network regions of the network;
 - generating a statistical model of the network using the set of parameters, the statistical model mathematically predicting connectivity between the network regions;
 - modifying at least one of the parameters within the set;
 - simulating the network using the modified set of parameters and the statistical model; and
 - presenting results of the simulation for use in managing the network.
2. The method of Claim 1, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing the samples of the user activities to identify network addresses that may be translated into network locations within the network regions.
- 20 3. The method of Claim 1, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing cache information storing the samples to identify network addresses, which may be translated into network locations within the network regions, and amounts of time users connect to the network.
- 25 4. The method of Claim 1, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing requests for information and responses to requests for information from peers on a peer-to-peer network associated with the network to identify network addresses, which may be translated into network locations within the network regions, and distributions of data files stored by peers on the peer-to-peer network.

5. The method of Claim 1, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing published information regarding the network to identify relative uses of broadband and modem technologies to connect to the network.

10 6. The method of Claim 1, wherein the statistical model comprises a transition matrix that includes statistical probabilities that a user of the network will access the network regions.

15 7. The method of Claim 1, wherein the distribution of network resources across the network regions comprises a geographic distribution of network servers across geographic regions.

20 8. The method of Claim 1, wherein the samples identify network addresses, which include Uniform Resource Locators (URLs) and Internet Protocol (IP) addresses of sources and destinations of data transfers associated with user activities, the user activities including Web surfing, instant messaging, and electronic mail transactions.

25 9. The method of Claim 1, wherein the set of parameters further includes a network topology and a user population, wherein the network topology includes physical and virtual characteristics of network elements used by the network to transport data on the network.

30 10. The method of Claim 1, wherein modifying at least one of the parameters within the set comprises increasing a user population associated with the network, and wherein simulating the network using the modified set of parameters and the statistical model comprises simulating the network using the increased user population and the statistical model.

11. The method of Claim 1, further comprising:
 - simulating the network using the set of unmodified parameters and the model;
 - comparing results of the simulation using the set of unmodified parameters to other estimations of network traffic; and

5 adjusting the model based on the results of the simulation using the set of unmodified parameters to correlate the model with the other estimations.

12. Logic for estimating network traffic, the logic encoded in media and operable when executed to:

receive and analyze connectivity information associated with a network to identify a set of parameters, wherein the connectivity information includes a plurality of samples of user activities stored by a node on the network and the set of parameters includes a distribution of network resources across network regions of the network;

5 generate a statistical model of the network using the set of parameters, the statistical model mathematically predicting connectivity between the network regions;

modify at least one of the parameters within the set;

10 simulate the network using the modified set of parameters and the statistical model; and

present results of the simulation for use in managing the network.

13. The logic of Claim 12, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing the samples of the user activities to identify network addresses that may be translated into network locations within the network regions.

20 14. The logic of Claim 12, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing cache information storing the samples to identify network addresses, which may be translated into network locations within the network regions, and amounts of time users connect to the network.

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15. The logic of Claim 12, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing requests for information and responses to requests for information from peers on a peer-to-peer network associated with the network to identify network addresses, which may be translated into network locations within the network regions, and distributions of data files stored by peers on the peer-to-peer network.

16. The logic of Claim 12, wherein receiving and analyzing the connectivity information associated with the network to identify the set of parameters comprises receiving and analyzing published information regarding the network to 5 identify relative uses of broadband and modem technologies to connect to the network.

17. The logic of Claim 12, wherein the statistical model comprises a transition matrix that includes statistical probabilities that a user of the network will 10 access the network regions.

18. The logic of Claim 12, wherein the distribution of network resources across the network regions comprises a geographic distribution of network servers across geographic regions.

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19. The logic of Claim 12, wherein the samples identify network addresses, which include Uniform Resource Locators (URLs) and Internet Protocol (IP) addresses of sources and destinations of data transfers associated with user activities, the user activities including Web surfing, instant messaging, and electronic 20 mail transactions.

20. The logic of Claim 12, wherein the set of parameters further includes a network topology and a user population, wherein the network topology includes physical and virtual characteristics of network elements used by the network to 25 transport data on the network.

21. The logic of Claim 12, wherein modifying at least one of the parameters within the set comprises increasing a user population associated with the network, and wherein simulating the network using the modified set of parameters 30 and the statistical model comprises simulating the network using the increased user population and the statistical model.

22. The logic of Claim 12, further operable when executed to:
simulate the network using the set of unmodified parameters and the model;
compare results of the simulation using the set of unmodified parameters to
other estimations of network traffic; and
5 adjust the model based on the results of the simulation using the set of
unmodified parameters to correlate the model with the other estimations.

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23. A method for managing network traffic comprising:
analyzing peer-to-peer communications between peers on a peer-to-peer
network;
identifying, based on the peer-to-peer communications, peer-to-peer
5 information, the peer-to-peer information including network addresses of the peers, a
distribution of peers within the peer-to-peer network, and a distribution of data files
stored by the peers;
intercepting a control message sent from a first peer to a second peer; and
modifying the control message based on the peer-to-peer information.

10 24. The method of Claim 23, further comprising:
generating a mathematical model of the network using the peer-to-peer
information, the mathematical model suggesting appropriate modifications to the
control message based on the peer-to-peer information;
15 wherein modifying the control message based on the peer-to-peer information
includes modifying the control message as suggested by the mathematical model.

25. The method of Claim 24, further comprising:
identifying a third peer of the peer-to-peer network using the mathematical
20 model, wherein a first distance between the first peer and the third peer is less than a
second distance between the first peer and the second peer;
wherein modifying the control message as suggested by the mathematical
model includes redirecting the control message to the third peer.

25 26. The method of Claim 24, further comprising:
identifying a third peer of the peer-to-peer network using the mathematical
model, wherein a first bandwidth between the first peer and the third peer is greater
than a second bandwidth between the first peer and the second peer;
wherein modifying the control message as suggested by the mathematical
30 model includes redirecting the control message to the third peer.

27. The method of Claim 24, further comprising:

identifying a third peer of the peer-to-peer network using the mathematical model, wherein network congestion in a network region associated with the third peer is less than network congestion in a network region associated with the second peer;

5 wherein modifying the control message as suggested by the mathematical model includes redirecting the control message to the third peer.

10 28. The method of Claim 23, wherein modifying the control message based on the peer-to-peer information includes modifying the control message to redirect the control message to a third peer, the third peer located in a same network region as the first peer.

15 29. The method of Claim 23, wherein modifying the control message based on the peer-to-peer information includes controlling the time at which a data file requested by the first peer is transmitted to the first peer.

20 30. The method of Claim 23, wherein modifying the control message based on the peer-to-peer information includes generating a response to the control message, the response identifying peers located in a same network region as the first peer and storing a requested data file.

31. The method of Claim 23, wherein the distribution of peers identifies at least one network region of the peer-to-peer network associated with at least one set of peers.

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32. The method of Claim 23, wherein the control message requests a transmission of a particular data file to the first peer.

30 33. The method of Claim 23, wherein the control message requests a list of peers storing a particular data file.

34. The method of Claim 23, further comprising identifying bandwidth information associated with the peers based upon the peer-to-peer communications, wherein modifying the control message based on the peer-to-peer information includes redirecting the control message to a third peer based in part upon the 5 bandwidth information.

35. The method of Claim 23, further comprising identifying the second peer as a super peer within a subnetwork of the peer-to-peer network, wherein the super peer is operable to direct requests for data files among the peers.

36. Logic for managing network traffic, the logic encoded in media and operable when executed to:

analyze peer-to-peer communications between peers on a peer-to-peer network;

5 identify, based on the peer-to-peer communications, peer-to-peer information, the peer-to-peer information including network addresses of the peers, a distribution of peers within the peer-to-peer network, and a distribution of data files stored by the peers;

intercept a control message sent from a first peer to a second peer; and
10 modify the control message based on the peer-to-peer information.

37. The logic of Claim 36, further operable when executed to:

generate a mathematical model of the network using the peer-to-peer information, the mathematical model suggesting appropriate modifications to the
15 control message based on the peer-to-peer information;

wherein modifying the control message based on the peer-to-peer information includes modifying the control message as suggested by the mathematical model.

38. The logic of Claim 37, further operable when executed to:

20 identify a third peer of the peer-to-peer network using the mathematical model, wherein a first distance between the first peer and the third peer is less than a second distance between the first peer and the second peer;

wherein modifying the control message as suggested by the mathematical model includes redirecting the control message to the third peer.

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39. The logic of Claim 37, further operable when executed to:

identify a third peer of the peer-to-peer network using the mathematical model, wherein a first bandwidth between the first peer and the third peer is greater than a second bandwidth between the first peer and the second peer;

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wherein modifying the control message as suggested by the mathematical model includes redirecting the control message to the third peer.

40. The logic of Claim 37, further operable when executed to:

identify a third peer of the peer-to-peer network using the mathematical model, wherein network congestion in a network region associated with the third peer is less than network congestion in a network region associated with the second peer;

5 wherein modifying the control message as suggested by the mathematical model includes redirecting the control message to the third peer.

10 41. The logic of Claim 36, wherein modifying the control message based on the peer-to-peer information includes modifying the control message to redirect the control message to a third peer, the third peer located in a same network region as the first peer.

15 42. The logic of Claim 36, wherein modifying the control message based on the peer-to-peer information includes controlling the time at which a data file requested by the first peer is transmitted to the first peer.

20 43. The logic of Claim 36, wherein modifying the control message based on the peer-to-peer information includes generating a response to the control message, the response identifying peers located in a same network region as the first peer and storing a requested data file.

44. The logic of Claim 36, wherein the distribution of peers identifies at least one network region of the peer-to-peer network associated with at least one set of peers.

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45. The logic of Claim 36, wherein the control message requests a transmission of a particular data file to the first peer.

30 46. The logic of Claim 36, wherein the control message requests a list of peers storing a particular data file.

47. The logic of Claim 36, further operable when executed to identify bandwidth information associated with the peers based upon the peer-to-peer communications, wherein modifying the control message based on the peer-to-peer information includes redirecting the control message to a third peer based in part upon
5 the bandwidth information.

48. The logic of Claim 36, further operable when executed to identify the second peer as a super peer within a subnetwork of the peer-to-peer network, wherein the super peer is operable to direct requests for data files among the peers.